GUIDANT

microLoad.net

SS06045 Issue/Rev. 0.9 (11/25)

Smith Meter® Electronic Preset Delivery System

The Smith Meter microLoad.net is a microprocessor-based instrument with Ethernet capability. It is designed to monitor and control a single-product straight loading and unloading. The unit can operate either as a stand-alone instrument or be part of system in which it communicates with an automation or supervisory control and data acquisition (SCADA) system.

Features

- One arm, single-product loading and unloading
- Standalone or remote controlled operation
- Lease automation custody transfer (LACT) control with basic sediment and water (BS&W) monitoring, sampling, and diverting
- Ethernet communications port
- Modbus and Smith communication protocols

Features

- Event, transaction, and weights and measures audit logging
- User configurable load ticket and display
- Automatic volume correction of refined and crude liquids from liquified petroleum gas (LPG) to asphalt based on temperature, pressure, and density using API MPMS CH. 11.1-2004 tables and all industry standard calculations
- Promass Coriolis meter communications for density and status
- Globally weight and measures and electrical safety approved
- Built in web server for browser access
- Transaction log export to spreadsheet
- Programmable pulse output
- Fully programmable flow profile
- Display backed-up per International Organization of Legal Metrology (OIML)
- Three levels of parameter access security
- Automated proving assistance
- Boolean and algebraic custom logic expressions
- Additization of metered or unmetered products
- microMate configuration utility included
- Continuous monitoring of critical functions
- Configurable language and messages
- Pulse security level B

Standard Features

Temperature Compensation

The temperature compensation feature provides the customer the ability to compensate for variance in temperature from a reference temperature. This feature is used with a resistance temperature detector (RTD) input or a temperature transducer, and, excluding the accuracy of the fluid temperature measurement, will exactly match the proper volume correction factor of ASTM-D-1250-04 and API MPMS chapter 11.1-2004 tables as noted below, over the fluid temperature range of -58 to 302 °F (-50 to 150 °C).

The following API tables can be programmed in the microLoad.net: 5A, 5B, 5D, 6A, 6B, 6C, 6D, 23A, 23B, 23D, 23E, 24, 24A, 24B, 24D, 24E, 53A, 53B, 53D, 53E, 54, 54A, 54B, 54C, 54D, 54E, 59A, 59B, 59D, 59E, 60A, 60B, 60D, 60E, BRIA, BRIP, and BR2P, and ETH/Gas (PTB), Aromat.

Pressure Compensation

Pressure compensation provides customers with the ability to compensate the volume of product delivered at varying pressures per API tables 11.2.1 and 11.2.2, using a 4-20 milliampere (mA) pressure transducer input. This feature also contains real-time control functions for maintaining system pressures at the meter to a minimally-acceptable, user-definable level (pressure transducer not included). Pressure compensation is particularly useful for light products, such as LPG, where the compressibility factor varies greatly with different pressures.

Density Correction

The density correction feature provides customers with the ability to correct the volume of product delivered at varying densities. The microLoad can read the line density as a 4-20 mA analog signal or through communications when using a Promass Coriolis meter.

Metered Injectors, Piston Injectors, and Smart Additives

The microLoad.net was designed to provide maximum flexibility when it comes to additive control. The unit is capable of handling metered injectors, piston injectors, and smart additives simultaneously.

The microLoad.net can control four additive injector systems: one metered injector and three piston or smart injectors or four piston or smart injectors.)

The microLoad.net controls the additive solenoids of metered injectors to precisely inject additive into the main product. It monitors the pulses of the additive meter and controls the amount of additive, based on the incoming pulses from the additive meter and main product meter.

Additive monitoring provides the capability for the microLoad.net to monitor feedback from the piston injectors of the additive products. The microFlow.net monitors the injector feedback switches for a change of state and counts the errors and alarms if no change is detected within the cycle or a period of time, depending on how the unit is programmed. The microLoad.net totalizes additive volume based on confirmation signals and a programmable volume per cycle. The totalized volume prints on the emulated load ticket printed on the printer output.

For smart additives, the firmware was designed with a client/server type of communications, with the microLoad.net being the host and the additive injector system being the device. The microLoad.net constantly interrogates the additive injector system for a change in status. The microLoad.net can be operated with communications control over the smart additive injector system or with communication and pulse control. When the microLoad.net has communication control over the additive system, it will constantly monitor the additive system for its status, poll the additive totals, and signal the system when to inject additive, all through the communications line.

The microLoad.net communications package was also designed with a pass-through communications mode.

In this mode of operation the supervisory computer communicates with the additive injector system through communication lines run to the microLoad.net and from the microLoad.net to the additive injector systems.

Additization of Unmetered Products

The microLoad.net has a feature that allows it to additize products that do not have a meter providing pulses on the main product stream. This feature was added to provide a device to handle the injection of lubricity additive into low sulfur diesel where the diesel is not being metered. The microLoad.net has been designed to handle three separate scenarios for the application:

- Scenario 1: With meter on main product (standard method), the microLoad.net receives pulses from product meter and paces additive accordingly.
- Scenario 2: Flow switch on main product line containing no meter. With no meter on the main product, the microLoad.net will simulate pulses. These pulses will be generated to match the selected high flow rate and therefore, the additive will be paced according to the predicted flow rate rather than the actual flow.
- Scenario 3: No flow switch or meter on main product. The microLoad.net will start simulating pulses when the START key is pressed and therefore, an operator must be present. Similarly, the batch preset size must be accurate as the addization will be done over the entire preset amount.

Dual-Pulse Security

Dual-pulse security provides continuous monitoring and error-indication alarms of pulse transmission for the meter according to API MPMS Chapter 5.5, Level B and Institute of Petroleum (IP) Standard IP 252/76, Part XIII, Section 1, Level B.

Automated Proving Mode

The microLoad.net firmware provides an automated proving mode of operation. When the automated proving mode is activated, the microLoad.net calculates the meter factor for a proving run based on information obtained during the prove. The operator can select the flow rate and meter factor being proved through the keypad of the microLoad.net. After the prove is complete, the operator enters the prover volume and prover temperature and the microLoad.net will calculate the new meter factor which the operator can download to the program or ignore. The microLoad.net also has the capability of providing an average meter factor over a maximum of ten batches. This feature allows the operator to prove the meter at up to four different flow rates without having to enter the program mode for each meter factor.

Boolean and Algebraic Processing

The microLoad.net provides customers flexibility to set up inputs and outputs for tasks that are not standard in the unit. Through Boolean processing, relays can be turned on and off through equations and events set up by customers. For example, a relay is required to close at the first trip point of the load. This is be set up using Boolean processing and does not require special software from the manufacturer.

Customers also can use algebraic processing to do simple mathematical calculations not included in the unit. These calculations can then be used in configurable reports or delivery display for the current transaction. The last five user boolean and the last five user float registers are stored with the transaction.

Communications

The microLoad.net is equipped with three standard programmable communication ports that can be configured to be either EIA-232 or EIA-485 compatible communication ports, with baud rates up to 38,400 bits per second (bps). In addition to these

three communication ports, an Ethernet port is available to support Modbus and Smith protocols.

Shared Printing

Shared printing allows multiple microLoads to generate reports on a single printer. A single microLoad.net can be configured to act as a "print server" (host) and all other microLoads to be "shared printers" (clients). Once the client microLoad.nets are configured as shared printers, they will have their communication, transmit, and receive lines tied together and connected to a single comm port on the print server. When a shared printer microLoad is done with a transaction and print is pressed on its keypad, the report is sent via communications to the host, where it will be printed.

Applications

The microLoad is ideal for any liquid transfer application requiring accurate weights and measures approved measurement and precise real-time control. Configurability has been built-in which allows every aspect of the operation to be tailored to fit a wide variety of situations.

Refined Products

Batch loading and unloading of alcohol, gasoline, lube oils, fuel oils, solvents, fertilizers, LPGs, LNGs, and liquid chemicals into trucks, rail cars and barges. Ideal for bulk plants, shipping docks, processing installations, and tank farms where a single unblended product is transferred.

Crude Oil

The microLoad supports loading, unloading and LACT transfers of crude oil with built-in facilities to monitor and average BS&W, control a sampler with up to four sample cans, and full diverter valve control. Refer to microLoad.net LACT, Loading and Unloading of Crude Oil Applications (AB06100) for additional information regarding upstream/crude oil applications.

Hardware Options

OIML Display

The microFlow.net is designed with two display options. The standard display option operates until power is lost and then goes blank. The OIML display option is the same display, but when power is lost, the display maintains the last data for reading by an operator for up to 15 minutes.

Specifications

Accuracy

- Calculated accuracy is the gross at standard temperature to gross volume ratio, excluding the accuracy of fluid temperature measurement and exactly matches the proper volume correction factor or ASTM-D-1250-04 over fluid temperature range of -58 to +302 °F (-50 to +150 °C).
- Temperature measurement accuracy is when the fluid temperature is measured to within +/- 0.72 °F (+/-0.4 °C) over the fluid temperature of -328 to 572 °F (-200 to 300 °C). Fluid temperature is measured to within +/- 0.45 °F (+/-0.25 °C) over the fluid temperature range of 32 to 572 °F (0 to 300 °C).

The microLoad.net's stability is 0.1 °F (0.06 °C) per year.

Flow totalization is within one pulse of input frequency.

Electrical Inputs

AC Instrument Input Power

Dual voltage input: 115 or 230 volts alternating current power (VAC) via switch selection, 50/60 hertz (Hz)

Power consumption: Approximately 9W

Power interruption tolerance: Interruption of power greater than 0.05 seconds (typical) will cause an orderly shutdown of the microFlow.net and the control valve will be immediately signaled to close

Digital (Meter Signal) Pulse Inputs

Type: Optically-isolated, solid-state voltage sensors

Quantity: Two

Input voltage range: 5 to 28 volts direct current (VDC) compatible

Pickup Voltage: 5 VDC minimum

Drop-out voltage: 1 VDC maximum

Current at maximum voltage: 20 mA maximum

Minimum pulse input frequency: 3 Hz

Input level duration: 83 microseconds (µS) minimum

Digital Control Inputs

Type: Optically-isolated, solid-state voltage sensors

Quantity: Three

Input voltage range: 5 to 28 VDC compatible

Pickup voltage: 5 VDC minimum

Drop-out voltage: 1 VDC maximum

Current at maximum voltage: 20 mA maximum

Input level duration: 120 milliseconds (ms) minimum

Analog Inputs

Type: 20-bit analog-to-digital converters

Function: One resistance temperature device (RTD), one 4-20 mA

Temperature Resistance Temperature Detector (RTD)

Type: Four-wire, 100-ohms platinum RTD with a temperature coefficient at 32 °F to be 0.00214 ohms per °F (0.00385 ohms/°C)

Temperature range: -148 to +572 °F (-100 to +300 °C)

Temperature measurement accuracy: ±0.72 °F (±0.4 °C) over the specified range

Current (4-20 mA) Input

Type: Two-wire, 4-20 mA current loop receiver, programmable as to function

Span adjustment: Program adjustable

Input burden: 50 ohms

Accuracy: ±0.025% of range

Resolution: One part in 1,048,576

Voltage drop: Two volts maximum

Sampling rate: One sample per 300 millesecond (ms) minimum

Electrical Outputs

DC Power

12 VDC +/-5%, 180 mA maximum, short-circuit protected.

AC Digital Outputs

Type: Optically isolated, solid-state output, user-programmable as to function

Quantity: Four

Load voltage range: 90 to 280 VAC root mean square (RMS) 48 to 63 Hz

Steady-state load current range: 0.05amp (RMS) minimum to 0.50 amp (RMS) maximum into an inductive load

Leakage current at maximum voltage rating: 2.5 mA maximum at 240 VAC

On-state voltage drop: 2.0 VAC at maximum load

DC Digital Outputs

Type: Optically isolated, solid-state open-collector output, user-programmable as to function

Quantity: Two

Switch blocking voltage: 30 VDC maximum

Load current: 150 mA maximum with 0.6 volt drop; power down - normally open

Pulse Output

Type: Optically isolated, solid-state open-collector output; pulse-output units are program-selectable through the microLoad.net keypad or communications

Switch-blocking voltage (switch off): 30 VDC maximum

Load current (switch on): 10 mA with 0.6 volts drop

Frequency range: 0 to 3,000 Hz

Duty cycle: 50/50 (on/off)

Environmental

Ambient operating temperature: -13 to 140 °F (-25 to +60 °C)

Humidity: 5 to 95% with condensation

Enclosure: Explosion-proof (NEMA 7, Class I, Groups C and D) and watertight (NEMA 4X), IP 65

Electrical Safety Approvals

North American

UL/CUL Listed 557N 557N UL File E23545

Class I, Division 1, Groups C, D; Class II, Groups E, F, G

Class I, Zone 1, AEx d ib IIB T6

UL Enclosure 4X, CSA Enclosure

Global

Ex db ib IIB T6 Gb Tamb -25 °C + 60 °C IP65

ATEX: DEMKO 04 ATEX 0403315X

IEC: IECEx UL 04.0007X

UL Brazil: 25.1037X

Electromagnetic Compatibility

European Union: EMC Directive 2014/30/EU EN 61326-1 Electrical equipment for measurement, control, and laboratory use.

Communications

Number of ports: Three plus Ethernet

Configuration: EIA-485 Four-wire or two-wire multidrop network with optional termination resistor or EIA-232 three-wire communications link

Data rate: Programmable asynchronous data (baud) rate from 2,400 to 38,400 bps

Data format: Fixed at one start bit, one stop bit, eight data bits, and no parity

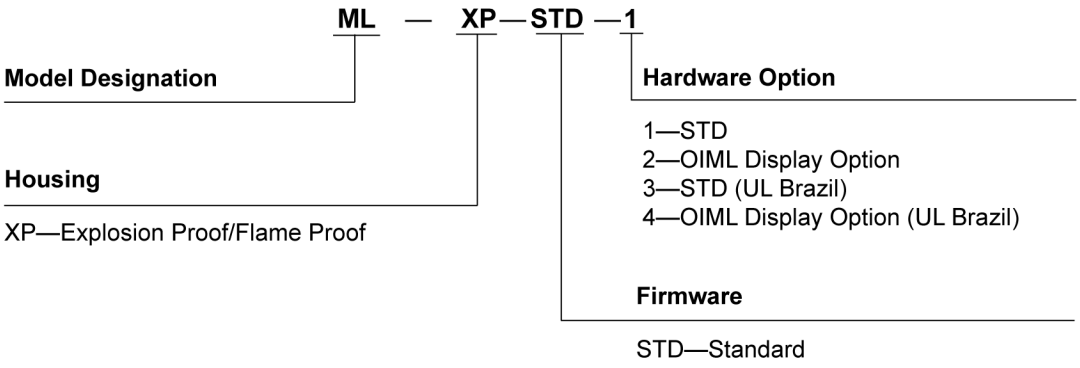
Line protocol: Full duplex, no echo character

Data structure: American Standard Code for Information Interchange (ASCII) character oriented, modeled after ISO Standard 1155

Protocol: Smith Meter ASCII longitudinal redundancy check (LRC), Smith Meter ASCII carriage return (CR), Smith Meter ASCII binary

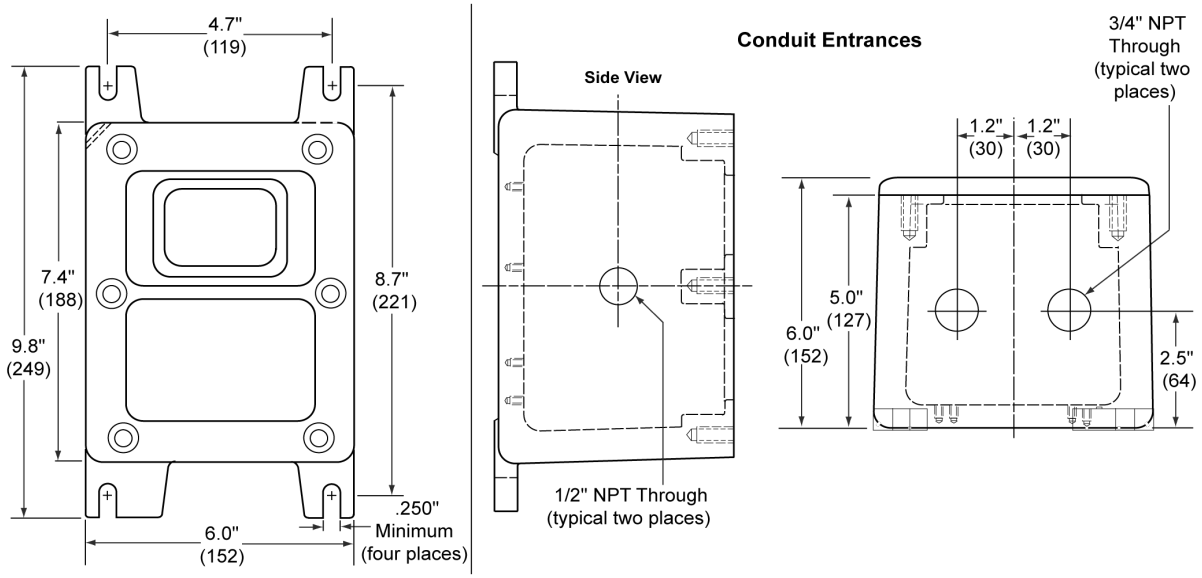
Ethernet: 10/100 Base-T RJ-45 8- or 10-pin unshielded twisted pair (UTP) connector

Modeling Code



Dimensions

Inches are to the nearest tenth (millimeters (mm) to the nearest whole mm), each independently dimensioned from respective engineering drawings.



The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacture that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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